

## Lab: Relationship Between Intermolecular Forces and Properties

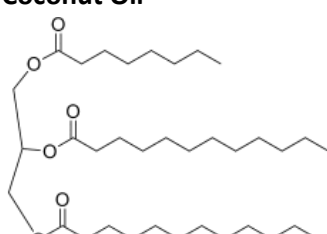
### Purpose:

To investigate the relationship between intermolecular forces and physical properties of several different substances.

### Pre-Lab:

Read the procedure and create data table(s) in which to record your observations while performing this lab.

### Useful Background Information:

<b>Decane</b> $  \begin{array}{cccccccccccc}  & H & H & H & H & H & H & H & H & H & H & H \\  &   &   &   &   &   &   &   &   &   &   &   \\  H & -C & -C & -C & -C & -C & -C & -C & -C & -C & -C & -H \\  &   &   &   &   &   &   &   &   &   &   &   \\  & H & H & H & H & H & H & H & H & H & H & H  \end{array}  $	<b>Glucose</b> $  \begin{array}{c}  H \\    \\  C=O \\    \\  H-C-OH \\    \\  HO-C-H \\    \\  H-C-OH \\    \\  H-C-OH \\    \\  CH_2OH  \end{array}  $
<b>Isopropyl Alcohol</b> $  \begin{array}{c}  & H & & \\  &   & & \\  & O & & \\  &   & & \\  H & -C & -C & -C & -H \\  &   &   &   & \\  & H & H & H &  \end{array}  $	<b>Coconut Oil</b> 

**Polarity Index:** <http://macro.lsu.edu/howto/solvents/Polarity%20index.htm>

Materials	Apparatus
<ul style="list-style-type: none"> <li>Distilled water</li> <li>Decane</li> <li>Isopropyl alcohol</li> <li>Copper (II) Chloride</li> <li>Coconut oil</li> <li>Glucose crystals</li> <li>3 small pieces of paper towel</li> </ul>	<ul style="list-style-type: none"> <li>Penny (3)</li> <li>7 Medium test tubes and rack</li> <li>Stirring rods (3)</li> <li>Scoopulas (3)</li> <li>Droppers (3)</li> <li>50 mL beakers (3)</li> <li>Hot plate</li> <li>10 ml graduated cylinders</li> </ul>

## Procedure:

### Part A: Water as a Solvent

1. Place approximately 5 mL of water into each of 5 test tubes that are labelled 1-5.
2. Add a 5 drops of solute (if a liquid), or a small amount of crystals (if a solid) to the water in each test tube as follows:

Test Tube	Solute
1	Decane
2	Isopropyl alcohol
3	Copper (II) Chloride
4	Coconut oil
5	Glucose Crystals

### Part B: Decane as a Solvent

1. Place approximately 5 mL of mineral oil into each of 5 test tubes that are labelled 1-5.
2. Add a 5 drops of solute (if a liquid), or a small amount of crystals (if a solid) to the water in each test tube as follows:

Test Tube	Solute
1	Water
2	Isopropyl alcohol
3	Copper (II) Chloride
4	Coconut oil
5	Glucose Crystals

### Part C: Isopropyl Alcohol as a Solvent

1. Place approximately 5 mL of isopropyl alcohol into each of 5 test tubes that are labelled 1-5.
2. Add a 5 drops of solute (if a liquid), or a small amount of crystals (if a solid) to the water in each test tube as follows:

Test Tube	Solute
1	Water
2	Decane
3	Copper (II) Chloride
4	Coconut Oil
5	Glucose Crystals

### Part C: Volatility of Solvents

1. Place one drop of water on a piece of filter paper.
2. Repeat for isopropyl alcohol and for decane.
3. Record the time it takes for each liquid to evaporate.

### Part D: Cohesive Properties of Solvents

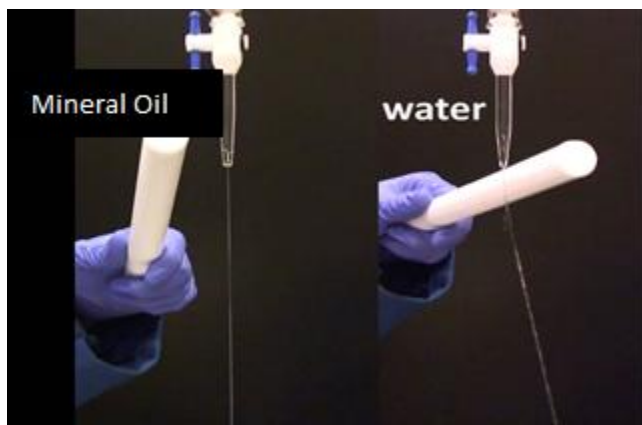
1. Place three pennies heads up on a paper towel.
2. On one penny, count how many drops of decane fit on the penny head before it spills off. Record what shape it make if any?
3. Repeat step 2 using the second penny and water. Record what shape it make if any.
4. Repeat step 2 using the third penny and isopropyl alcohol. Record what shape it make if any.
5. Record results in the data table.

### Part E: Melting Point of Solutes

1. Place a small amount of copper (II) chloride, coconut oil, and glucose into each of 3 labelled 50 mL beakers.
2. Put the beakers on a hot plate set to a medium temperature.
3. Record the order in which they melt. (note: one has a dangerously high melting point, so stop after 2 substances have melted!).

### Part F: Attraction to Charge

1. Bring a charged rod near a stream of a liquid covalent compound. Evaluate the pictures below and record the data in your data table.



### What to include in your lab report:

- Purpose, Materials/Apparatus, Procedure – see handout
- Data tables – properly formatted.
- Analysis – summarize properties of each substance and relate to intermolecular properties.
- References – include a bibliography if external sources are used for analysis.